PD 6694-1:2011+A1:2020



BSI Standards Publication

Recommendations for the design of structures subject to traffic loading to BS EN 1997-1:2004+A1:2013



Publishing and copyright information

The BSI copyright notice displayed in this document indicates when the document was last issued.

© The British Standards Institution 2020

Published by BSI Standards Limited 2020

978 0 539 06625 8

ICS 93.020

The following BSI references relate to the work on this document: Committee reference B/526 Drafts for comment 08/30189211 DC; 19/30405292 DC

Amendments/corrigenda issued since publication

Date	Text affected
31 May 2020	A1: see Foreword

© THE BRITISH STANDA

Contents		Page
	Foreword	iv
0	Introduction	1
1	Scope	1
2	Normative references	1
3	Terms, definitions, symbols and abbreviations	2
	Table 1 — Latin letters	3
	Table 2 — Greek letters	4
	Table 3 — Abbreviations	4
4	Basis of design	4
4.1	Geotechnical category	4
4.2	Design methods	4
4.3	Actions	5
4.4	Dispersion of vertical loads through the fill	5
4.5	The serviceability limit state	5
4.6	Treatment of permanent actions arising from a single source	5
4.7	Model factors on earth pressure coefficients	6
4.8	Constant volume (critical state) angles of shearing resistance	7
5	Spread foundations	7
5.1	Horizontal earth pressures to be used for the design of spread foundations	7
5.2	Bearing resistance	8
5.3	Drained and undrained bearing resistance	8
5.4	Sliding	9
6	Piled foundations	9
6.1	Piles subject to horizontal loading	9
6.2	Design of pile groups	9
7	Gravity bridge abutments and retaining structures	10
7.1	Backfill parameters	10
7.2	Earth pressures	10
	Table 4 — Values of K_a for a vertical face when $\delta = \beta$	11
	Figure 1 — Earth pressure on retaining structures	12
7.3	Earth pressures for structural analysis	13
7.4	Ductile structures and brittle failure modes	14
7.5	Movement required to generate passive pressure	14
7.6	Horizontal earth pressure due to traffic loading on earth retaining structures	15
	Table 5 — Simplified traffic surcharge model for walls and other retaining structures adjacent to	
	the carriageway, where the traffic does not cross over the structure	16
	Table 6 — Simplified traffic surcharge model for abutments	17
	Figure 2 — Horizontal surcharge model for abutments	18
	Figure 3 — Lateral and vertical dispersion of finite line loads for calculating horizontal	
	surcharge pressure	19
7.7	Hydrostatic pressure	20
8	Embedded walls	21
9	Integral bridges	21
9.1	General	21
9.2	Methods of analysis	21
9.3	Types of abutment for integral construction	22
_	Figure 4 — Types of abutment for integral bridge construction	24
9.4	Earth pressures behind integral abutments and end screen walls	25

	Table 7 — Maximum (unfavourable) vaues of $K_{p,t}$	25
	Figure 5 — Earth pressure distributions for abutments which accommodate thermal expansion	
	by rotation and/or flexure	27
	Figure 6 — Pressure coefficient envelope	30
9.5	Longitudinal loads	31
9.6	Thermal distortions	31
9.7	Foundations	31
9.8	Skew effects	32
	Figure 7 — Twisting of skewed structure	33
9.9	Wing walls	33
	Figure 8 — Equilibrium of horizontal earth wedge behind skew abutment	34
9.10	Backfill	34
10	Buried concrete structures	35
10.1	General	35
	Figure 9 — Symbols for typical buried box structure	36
10.2	Actions applied to buried concrete structures	36
	Figure 10 — Transverse load dispersion	38
	Figure 11 — Transverse load/metre where two dispersion zones overlap	38
10.3	Design of foundations	40
10.4	Skew	41
10.5	Longitudinal joints	41
10.6	Stages to be analysed	42
Annex A	(informative) Method for determining the earth pressures on integral abutments using a	
	soil-structure interaction analysis	43
	Figure A.1 — Variation in soil shear modulus factor, R_{pat} with d', /H' assuming	
	densification to 90%	46
	Figure A.2 — Values of H' and d' _d and illustration of earth pressures	47
Anney R	(informative) Cases to be considered for buried concrete structures design	49
AIIICAD	Figure B 1 — Maximum vertical load with maximum horizontal load	51
	Table R 1 — Directly determined design values of the earth pressure coefficient K that may be	51
	annlied at various limit states (Figure R 1)	51
	Figure B 2 — Minimum vertical load with maximum horizontal load	52
	Table R_2 — Directly determined design values of the earth pressure coefficient K that may be	52
	annlied at various limit states (Figure R 2)	52
	Figure B 3 — Maximum vertical load with minimum horizontal load	53
	Table R_{3} — Directly determined design values of the earth pressure coefficient K that may be	55
	annlied at various limit states (Figure B 3)	53
	Figure B 4 — Braking and acceleration with maximum vertical load and active pressure	00
	(Figure B.4)	54
	Table $B 4$ — Directly determined design values of the earth pressure coefficient K that may be	01
	applied at various limit states Figure B.4	55
	Figure B.5 — Braking and acceleration with minimum vertical load and active pressures	55
	Table B.5 — Directly determined design values of the earth pressure coefficient K that may be	00
	applied at various limit states (Figure B.5)	56
	Figure B.6 — Directly determined desian values of the earth pressure coefficient K that may be	00
	applied at various limit states Figure B.6	57
	Table B.6 — Directly determined desian values of the earth pressure coefficient K that may be	5.
	applied at various limit states (Figure B.6)	58
	Pibliography	F 0
	DIDITOREAPITY	59

PUBLISHED DOCUMENT

Summary of pages

This document comprises a front cover, and inside front cover, pages i to vi, pages 1 to 60, an inside back cover and a back cover.

This is a preview. Click here to purchase the full publication.

RIGHTS RESERVED III

Foreword

Publishing information

This Published Document is published by BSI Standards Limited, under licence from The British Standards Institution and came into effect on 31 May 2011. It was prepared under the authority of B/526, *Geotechnics*. A list of organizations represented on this committee can be obtained on request to its secretary.

Supersession

PD 6694-1:2011+A1:2020 supersedes PD 6694-1:2011, which is withdrawn.

Relationship with other publications

This Published Document gives non-contradictory complementary information for the design of structures subject to traffic loading for use in the UK with BS EN 1997-1 for geotechnical design and its UK National Annex. Background is provided to some of the National Annex provisions where these differ from the values recommended in BS EN 1997-1.

Information about this document

This publication can be withdrawn, revised, partially superseded or superseded. Information regarding the status of this publication can be found in the Standards Catalogue on the BSI website at <u>bsigroup.com/standards</u>, or by contacting the Customer Services team.

Where websites and webpages have been cited, they are provided for ease of reference and are correct at the time of publication. The location of a webpage or website, or its contents, cannot be guaranteed.

Text introduced by or altered by Amendment No. 1 is indicated in the text by tags $[A_1]$ and $(A_1]$. Minor editorial corrections are not tagged.

Use of this document

As a guide, this Published Document takes the form of guidance and recommendations. It should not be quoted as if it were a specification or a code of practice and claims of compliance cannot be made to it.

This publication is not to be regarded as a British Standard.

Presentational conventions

The provisions in this Published Document are presented in roman (i.e. upright) type. Its recommendations are expressed in sentences in which the principal auxiliary verb is "should".

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

The word "should" is used to express recommendations of this Published Document. The word "may" is used in the text to express permissibility, e.g. as an alternative to the primary recommendation of the clause. The word "can" is used to express possibility, e.g. a consequence of an action or an event.

Notes and commentaries are provided throughout the text of this Published Document. Notes give references and additional information that are important but do not form part of the recommendations. Commentaries give background information.

Where words have alternative spellings, the preferred spelling of the Shorter Oxford English Dictionary is used (e.g. "organization" rather than "organisation").

As a UK Published Document, these presentational conventions are in accordance with BS 0 and national British Standard drafting rules. Therefore, the conventions might differ from the Eurocode that this Published Document supports.

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a Published Document cannot confer immunity from legal obligations.